Name:

at1117paper: Complete the Square (v327)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 48 feet. Their combined area, found by adding the square's area and the rectangle's area, is 868 square feet. What is the value of x?

Example's Solution

$$x^2 + 48x = 868$$

To complete the square, add $\left(\frac{48}{2}\right)^2 = 576$ to both sides.

$$x^2 + 48x + 576 = 1444$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 24)^2 = 1444$$

Undo the squaring.

$$x + 24 = \pm\sqrt{1444}$$

$$x + 24 = \pm 38$$

Subtract 24 from both sides.

$$x = -24 \pm 38$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 14$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 2464 square feet. What is the value of x?

$$x^2 + 60x = 2464$$

$$x^2 + 60x + 900 = 3364$$

$$(x + 30)^2 = 3364$$

$$x + 30 = \pm 58$$

$$x = 28$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 52 feet. The total area, of the square and rectangle, is 620 square feet. What is the value of x?

$$x^2 + 52x = 620$$
$$x^2 + 52x + 676 = 1296$$
$$(x + 26)^2 = 1296$$
$$x + 26 = \pm 36$$
$$x = 10$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 46 feet. The total area, of the square and rectangle, is 840 square feet. What is the value of x?

$$x^2 + 46x = 840$$
$$x^2 + 46x + 529 = 1369$$
$$(x + 23)^2 = 1369$$
$$x + 23 = \pm 37$$
$$x = 14$$